SOLUTIONS, INC.

Final Report

Hoechst Celanese Chemical Group, Ltd.
Bay City, Texas
Closure Report
Injection Well WDW-49 (Well No. 4)

ECO Job 96015A

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Houston, Texas 77042
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HOECHST CELANESE CHEMICAL GROUP, LTD.
BAY CITY TEXAS PLANT

CLOSURE OF CLASS I INJECTION WELL WDW-49 (WELL #4)

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ecc SOLUTIONS, INC.

PLUG AND ABANDON CERTIFICATION

The undersigned has reviewed all pertinent information concerning the plugging and abandonment of the Hoechst Celanese Chemical Group, Ltd. (HCCG) Class I injection well WDW-49 (Well #4) with regards to the plans and specifications set forth in Texas Natural Resource Conservation Commission (TNRCC), Underground Injection Control (UIC) Program and the current Federal and TNRCC requirements for the plugging and abandonment of a Class I injection well located in the State of Texas.

In accordance with TNRCC/UIC Program, 31 TAC 331.46 and the closure standards of HCCG's UIC Permit, I certify that WDW-49 (Well #4) was plugged and abandoned in compliance with the permit and applicable TNRCC regulations in effect at the time of closure

This certification is not valid unless the engineer's original signature and raised seal are present.

11/15/96
DATE

(SEAL)

Wesley W. Smith, P.E.
Texas Professional Engineer
No. 29398

1.0 INTRODUCTION AND SUMMARY

1.1 INTRODUCTION

Hoechst Celanese Chemical Group, Ltd. (HCCG) contracted with ECO Solutions, Inc. (ECO) to perform the plugging and abandonment (P&A) of Class I injection well, WDW-49 (Well No. 4), located at their Bay City plant. A schematic drawing of WDW-49 prior to and following P&A operations are included as Figures 1 and Figure 2, respectively. The attached report details the field activities and data associated with project.

The following provides an overview of the key elements of the P&A on WDW-49 (Well No. 4).

- Hoechst Celanese submitted and received approval for a closure plan as required by the Texas Natural Resource Conservation Commission (TNRCC), Underground Injection Control (UIC) Program, and the regulations contained within 31 TAC 331.46.

- A 50' section of the 7-5/8" long string casing string above the injection interval was removed by milling and underreamed out to a 15" radial diameter. Subsequent cementing operations re-established a secure cement plug between the 7 5/8" casing and confining shales.

- Squeeze cementing was accomplished through a perforated section of 7+5/8" casing below 10 3/4" surface casing shoe depth. This action improved the cement seal below the lowermost underground source of drinking water (USDW).

- Pertinent P & A data was placed on welded steel plate installed at the surface.

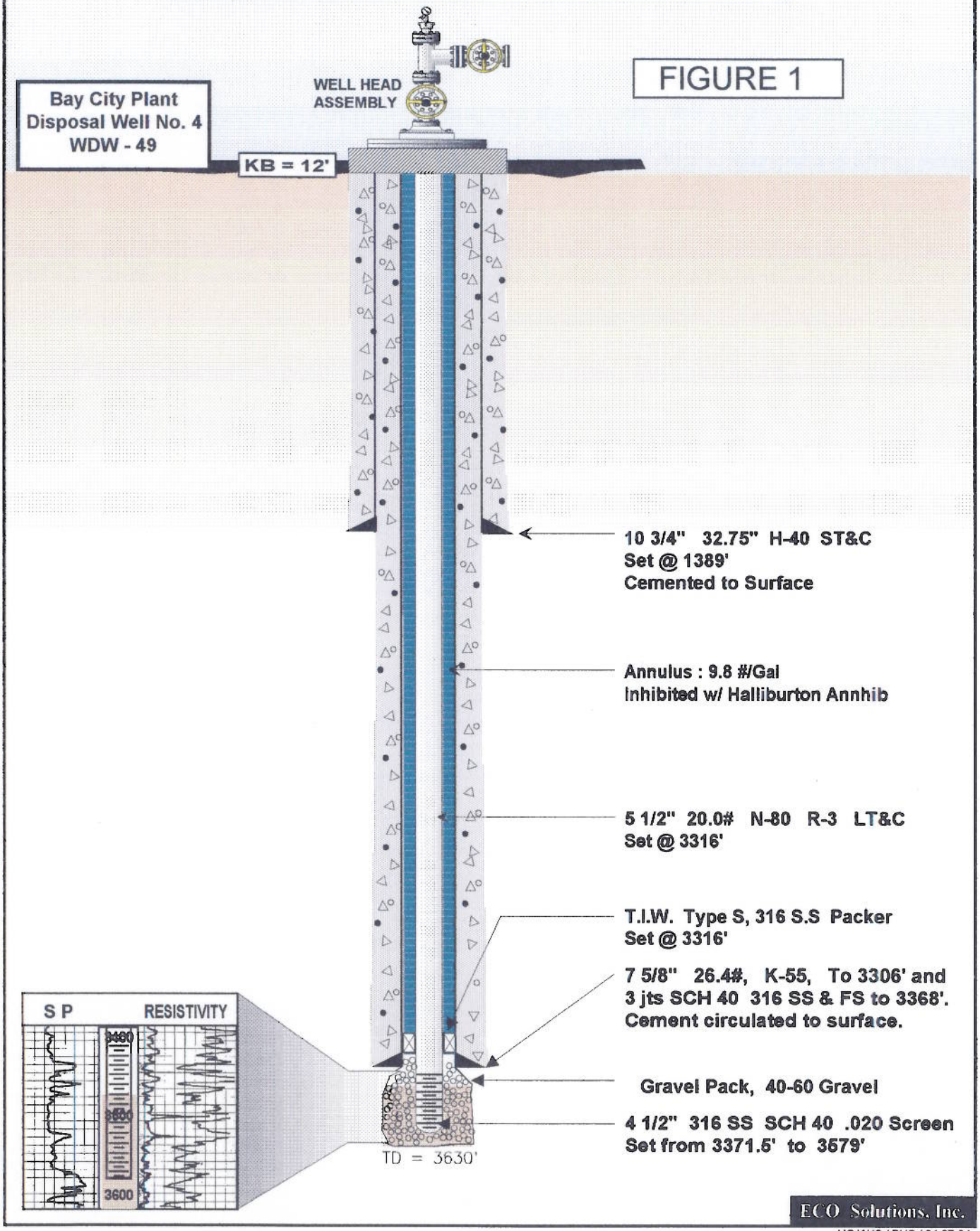
- Contained within the closure report is an executed copy of the Consent To Revocation Of Texas Natural Resource Conservation Commission Permit WDW- 49 form and a copy of the recorded deed was submitted to the TNRCC under a separate cover.

HCCG and/or ECO personnel contacted the TNRCC Austin office prior to commencing and during field operations to allow TNRCC personnel to witness cementing events during the P&A field operations.

HOECHST CELANESE CHEMICAL GROUP, Ltd.

FIGURE 1

Bay City Plant
Disposal Well No. 4
WDW - 49



ECO Solutions, Inc.

HC-W49 / BHS / 04-07-94

HOECHST CELANESE CHEMICAL GROUP, INC.

FIGURE 2

Bay City Plant
Disposal Well No. 4
WDW - 49

KB = 12'

CEMENT PLUGS AND VOLUMES

Plug 1	Inj. Interval	100 sx	109 ft
Plug 2	3208' - 2574	150 sx	163 ft^3
Plug 3	2574' - 1470'	340 sx	371 ft^3
Plug 4	1470' - 156'	370 sx	403 ft^3
Plug 5	156' - surface	30 sx	33 ft^3

Squeeze Perfs at
1456'-1458

10 3/4" 32.75" H-40 ST&C
Set @ 1389'
Cemented to Surface

50' section drilled
out to 15" from
3086' - 3136'

Cement Retainer Set @ +/-3230'

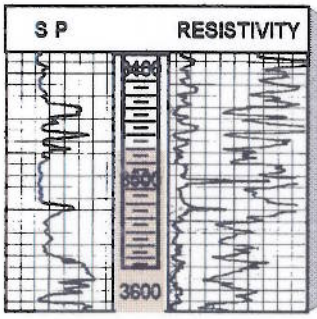
T.I.W. Type S, 316 S.S Packer
Set @ 3316'

7 5/8" 26.4#, K-55, To 3306' and
3 jts SCH 40 316 SS & FS to 3368'.
Cement circulated to surface.

Gravel Pack, 40-60 Gravel

4 1/2" 316 SS SCH 40 .020 Screen
Set from 3371.5' to 3579'

TD = 3630'



ECO Solutions, Inc.

1.2 SUMMARY OF CLOSURE ACTIVITIES

Dawson workover rig no. 356 was rigged up on WDW-49 (Well #4) to perform the milling and underreaming operations on the 7+5/8" 0. D. casing string. The 5 ½ " injection tubing was removed and a Halliburton wireline set "EZ-SV" cement retainer was set at 3230' ± . Cement plug No. 1 consisting of 100 sacks (109 ft^3) of Halliburton premium cement was placed into the injection interval and 22' above the cement retainer. The 7+5/8" casing was milled in the confinement interval from 3086' to 3136' and then the original cement was underreamed from 3050' to 3140' to a radial diameter of 15". Cement plug No 2 consisting of 150 sacks (163 ft^3) of Halliburton premium cement was placed from 3208' to 2574'. Cement plug No. 3 consisting of 340 sacks (371 ft^3) of Halliburton premium cement was placed from 2574' to 1470'. The 7+5/8" O.D. long string casing was perforated from 1456' to 1458' with 4 shots per foot. Cement No. 4 consisting of 370 sacks (403 ft^3) of Halliburton premium cement was placed from 1470 to 156'. A final cement plug no. 5 consisting of 30 sacks (33 ft^3) was placed from 156' to the surface. A 1/2" thick stainless steel plate with pertinent data inscribed on top, was welded to 7+5/8" casing extending up to grade and surrounded by cement at the surface.

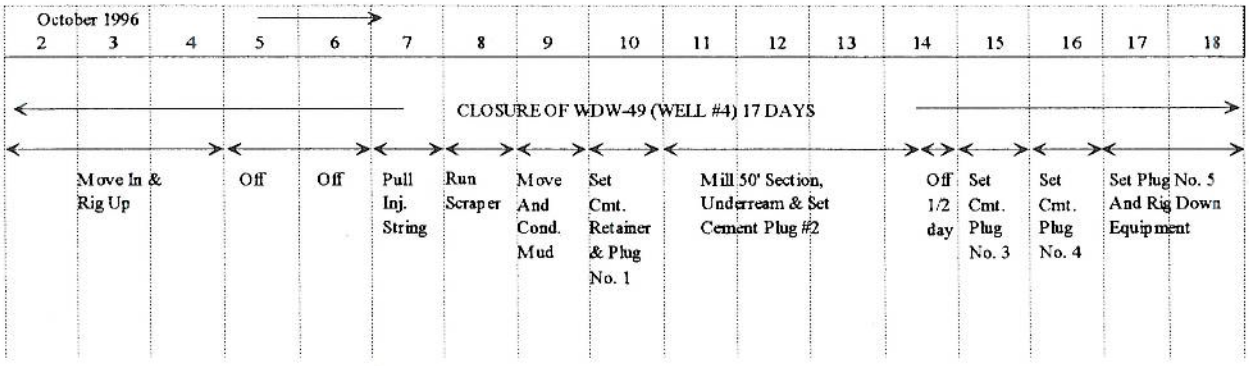
The plugging and abandonment of HCCG's WDW-49 field work was completed on October 18, 1996.

1.3 PROJECT TIMELINE

Figure 3 below is a project timeline that illustrates the key closure events versus the date. The field activities started on October 2, 1996 and ended on October 18, 1996. The total number of field days was 17.

Figure 3

CLOSURE OF WDW-49 (WELL #4) TIMELINE



2.0 SUMMARY OF FIELD ACTIVITIES

WEDNESDAY 10/2/96

Set rig anchors for support cables. Move in substructure. Moving tanks and equipment.

THURSDAY 10/3/96

Finish setting up rig. Continue to move in tanks, racks and other equipment from WDW-32 (well #3) to WDW-49 (well #4) location.

FRIDAY 10/4/96

Finish moving equipment and rigging up on WDW-49. Pump 250 bbls to triple rinse injection string. Pick up on injection string in release seal assembly. Remove wellhead. Nipple up blow out preventers and hydril. Prepare to remove injection string. Thomas Jones contacted Kathryn Herzog with the TNRCC to update her on the schedule the following week.

SATURDAY AND SUNDAY 10/5-6/96

Shut down with no cost. Field operations will resume on Monday 10/7/96

MONDAY 10/7/96

Continue rigging up equipment and preparing location. Franks Casing Crew arrived on location and rigged up their tongs and lay down machine in preparation for removal of the injection string from WDW-49 (Well #4). Pull of the hole and lay down 75 joints of pipe. The injection string was visually observed to be in excellent condition. Used Hoechst Celanese cherry pickers and riggers to move injection string to wash racks and move work string to well site. Bob Hall had a telephone conversation with Jim Boswell with the TNRCC to update him on the upcoming cementing schedule.

TUESDAY 10/8/96

Finish pulling remaining 4 joints of injection tubing from WDW-49. The total number of joints removed was 79. The injection tubing was transferred to the Hoechst Celanese wash area using plant cherry pickers and riggers. Rig down Franks equipment and lay down machine. Pick up 3 ½ " work string from racks and make up bit and scraper. Go in hole with bit and scraper to 3725'. No obstructions encountered. Pull out of the hole with the work string.

WEDNESDAY 10/9/96

Finish cleaning mud and mud mixing tank and use CAT to remove from WDW-32 (Well #3) location. Move mud and mixing tank to WDW-49 (Well #4) location. Move frac tanks to new location. Transfer drilling mud to tanks at WDW-49 (Well #4) location using super sucker truck. Condition mud in tanks in preparation for first cement plug and section milling. Rig up no. 1 and no. 2 PA-H mud mixing pumps. Finish setting up of equipment prior to start of 24 hour operations.

THURSDAY 10/10/96

Jim Boswell, TNRCC on Location

Move in and rig up Halliburton Logging Services to set EZ-SV cement retainer. Ran junk basket and gauge ring with GR/CCL. Ran correlation log from 3,316' - 2,500' and then again from 1700' - 1000'. Pulled out of the hole.

Closed blind rams and pump 200 bbls of clean brine down 7+5/8" casing. Brine intended to flush wellbore of annulus corrosion inhibitor and confirm well did not sand over while pulling the 5+1/2" injection string. No sand fill-up problems.

Picked up 7-5/8" EZ-SV cement retainer and went in hole with same on wireline. Set same at 3,230'. Pulled out of the hole with wireline and rigged down logging unit.

Closed blind rams and pressure tested casing and retainer to 500 psig for 15 minutes to confirm proper set- O.K. Picked up Halliburton Star Guide and went in hole with same on 3+1/2" drill pipe and stung into retainer and applied 20,000# compression on retainer. Pressure tested drill pipe/casing annulus to 500 psig for 2 minutes. OK. Pulled Star Guide out of retainer. Rigged up Halliburton pump truck and pumped 10 bbl fresh water spacer followed with 158 bbl 9.9#/gal mud followed with 20 bbl fresh water spacer down drill pipe. Stung back into retainer using 20,000# compression and pressure test annulus to 500 psig for 2 minutes - OK. Pumped 350 bbl fresh water into formation. Bleed pressure back from 865 to 390 psig and maintain same pressure during cementing operations.

Performed cement plug #1 using 100 sacks premium neat cement (1.09 cu. ft./sx yield). Displaced cement with 1 bbl fresh water, 22 bbl mud and pulled stinger (Star Guide) out of retainer. Pulled end of drill pipe up to 3180' & reversed circulated about 20 bbl mud. Rigged down Halliburton. Cement plug #1 set & completed at 1900 hours. Commenced circulating and conditioning mud at 1930 hours. Will circulate and condition mud while waiting on the cement column to cure. At 2030 hours Mud: 10.0 wt., 43 vis. Mr. Boswell (TNRCC) left location and plans to return to well site tomorrow AM.

FRIDAY OCTOBER 11, 1996

Continued circulating and conditioning mud system- gradually increasing yield point and fluid viscosity (desired yield point 8 - 10, currently 2 - 4; viscosity 60 - 70 seconds, currently 43 seconds. At 0100 hours mud started foaming. Ordered out mud defoaming chemical at 0130. Continued conditioning mud system. Treated mud system w/aluminum stereate (defoamer). Circulated treatment 2 full circulations.

Tagged top of cement at 3208', 22' of cement above retainer. Notified Jim Boswell , TNRCC of tagged depth. Jim was pleased with closure operations and stated that a TNRCC representative would not be present to witness the remaining cementing jobs. However, Mr. Boswell requested an update on rig activities next Thursday (10/17/96).

Started out of the hole with drill pipe at 12:00 p.m. - drill pipe pulling wet. Rigged up mud bucket to catch overflow. Rigging up to run section mill & drill collars 1500 to 2100 hours. Continued to circulate to clean up solids in mud system 2100 to 2200 hours. Commenced milling at 3086' at 2200 hours while circulating at a rate of 3-1/4 BPM, 80 RPM and 2-6,000 WOB. Milled from 3086' to 3098' in 9 hours with milling rate varying from 0.5 to 3 ft/hr.

SATURDAY OCTOBER 12, 1996

Mud Conditions: 9.5 - wt., 55 viscosity and recovering considerable iron and cement. At 0700 hours drilling at 3098'. Adding gel & additives to mud system to raise weight and viscosity. Milled from 3098' to 3109' from 0700 to 1900 hours (12) hours using 5-6,000 WOB, 4.8 BPM and 100 RPM. Continuing to mill ahead from 1900 to 2400 hours from 3109' to 3130'.

SUNDAY OCTOBER 13, 1996

Milling from 3130' to 3136' from 0000 to 0200 hours with same drilling conditions. Continued to circulate hole to remove solids from mud system from 0200 to 0330 hours. Also, transferred liquid mud from diked area through shale shaker back into mud storage system. Pulled out of hole and lay down mill. Picked up underreamer and ran into hole with drill collars on drill pipe and commenced opening hole to 15" from 3095' to 3140. Picked up underreamer and enlarged hole from 3090' to 3093'. Pull out of the hole and rack back drill collars. Lay down underreamer. Rig up Halliburton. Go into the hole open ended to top of last plug. Pump 20 bbl. Mud flush followed by 150 sack , 29 bbl premium cement. Pull out of the hole and close rams. Rig down Halliburton and wait on cement. Field operations will continue on a daylight basis on Tuesday. The estimated top of cement is 2580'.

MONDAY 10/14/96

Continue to wait on cement to set. The minimum cement curing time extended until noon on Monday. A decision was made to postpone resumption of closure operations until Tuesday morning. The decision to postpone operations due to the shortened day and the resumption of daylight operations.

Tuesday 10/15/96

Go in the hole open-ended with 3 ½ " drill pipe. Tag top of cement at 2574' and calculate cement requirements for plug #3. Cement plug #3 will extend from top of cement plug #2 up to 1450' ± (base of surface casing is at 1385'). Circulate rental drilling mud from wellbore with freshwater in Dawson open top 200 bbl. water tank. Circulate mud back to mud tanks. Utilize portable trash pump to pump mud from mud tanks to vacuum trucks. Francis will provide 5 vacuum trucks to transport mud from Hoechst Celanese plant to Francis storage in Galveston. Utilize AB Clean super sucker to empty volume of mud, metal and miscellaneous solids in lined portion of ditch. Utilize super sucker to clean both Dawson and Francis mud mixing tanks. Muddy water remaining from clean effort is stored in frac tanks for disposal by Hoechst Celanese.

Move in and rig up Halliburton to set premium cement plug #3. Set balanced cement plug using 340 sx (371 ft^3). Plug will extend from the top of cement plug #2 up to 1400'. Pull base of drill pipe up to 1475' and reverse circulate excess cement out of wellbore into lined ditch. Pull out of the hole and wait on cement overnight.

Wednesday 10/16/96

Open up with zero (0) psig. Remove 6" flowline and bell nipple and rig up Atlas wireline unit. Go into the hole with 5" perforating gun and tag top of cement at 1470'. Perforate from 1456' to 1458 with four shots per foot (4 spf). Go into the hole with work string to 1460' and rig up Halliburton. Set balanced plug extending from 1460' to 156'. Pull out of the hole laying down 46 joints of 3 1/2" drill pipe.

Thursday 10/17/96

Go into the hole and tag cement at 156'. Rig down substructure and stack using Hoechst Celanese cherry picker and rigger. Go into hole with work string and pump cement to surface. Lay down work string. Rig down Halliburton. Rig down pumps, generator and other equipment.

Friday 10/18/96

Continue to rig down and remove equipment.

APPENDIX A

CONSENT TO REVOCATION OF TEXAS NATURAL RESOURCE CONSERVATION COMMISSION PERMIT

CONSENT TO REVOCATION OF

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION PERMIT

I, C.R. Pennington, Facility Manager, acting on behalf of
(Name & Title)
Hoechst Celanese Chemical Group, Ltd., do hereby consent to
(Name of Permittee)

the revocation of Texas Natural Resource Conservation Commission Permit No. WDW-49, pursuant to the provisions of 30 TAC Section 305.67 (b).

The activities regulated by the permit were:

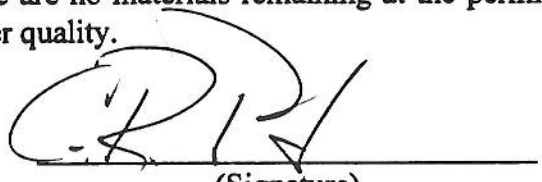
( ) Never begun (Wastewater treatment facility was not constructed)

(X) Terminated on or about (Date) October 18, 1996 (Waste Disposal Well plugged and abandoned)

Facility dismantled ( ); Facility will be dismantled ( ) ; Facility will be sold and relocated ( ).

( ) Diverted to another permitted wastewater treatment system
Please identify the facility to which flow has been diverted _____ and the approximate date the diversion occurred _____.

I also certify that there are no materials remaining at the permitted site which endanger ground or surface water quality.



(Signature)

(409) 241-4000
(Telephone No.)

November 13, 1996
(Date)

APPENDIX B

CEMENTING INFORMATION

Plugging Record

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

FORM W - 3
Rev. 12/92

API NO. (if avaliable) | 1. RRC District

FILE IN DUPLICATE WITH DISTRICT OFFICE OF DISTRICT IN WHICH WELL IS LOCATED WITHIN THIRTY DAYS AFTER PLUGGING | 4. RRC Lease or Id. Number

2. FIELD NAME (as per RRC Records) | 3. Lease Name | 5. Well Number

. OPERATOR | 6a. Original Form W-1 Filed in Name of: | 10. County

7. ADDRESS | 6b. Any Subsequent W-1's Filed in Name of: | 11. Date Drilling Permit Issued

8. Location of Well, Relative to Nearest Lease Boundaries of Lease on which this Well is located | Feet From | Line and | Feet From | Line of the | Lease | 12. Permit Number

9a. SECTION, BLOCK, AND SURVEY | 9b. Distance and Direction From Nearest Town in this County | 13. Date Drilling Commenced

6. TYPE WELL (OIL,GAS,DRY) | Total Depth | 17. If Multiple Completion List All Field Names and Oil Lease or Gas ID No's | GAS ID or OIL LEASE # | Oil - O Gas - G | WELL # | 14. Date Drilling Completed

18. If Gas, Amt. of Cond. on Hand at time of Plugging | 15. Date Well Plugged

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7	PLUG #8
*19. Cementing Date	10/10/96							
20. Size of Hole or Pipe in which Plug Placed (inches)								
21. Depth to Bottom of Tubing or Drill Pipe (ft.)								
*22. Sacks of Cement Used (each plug)	100							
*23. Slurry Volume Plumped (cu. ft.)	109							
*24. Calculated Top of Plug (ft.)	3210							
25. Measured Top of Plug (if tagged) (ft.)								
*26. Slurry Wt. #/Gal.	16.2							
*27. Type Cement	H							

28. CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT. #/FT.	PUT IN WELL (ft.)	LEFT IN WELL (ft.)	HOLE SIZE (in.)

29. Was any Non - Drillable Material (Other than Casing) Left in This Well ☐ Yes ☐ No

29a. If answer to above is "Yes" state depth to top of "junk" left in hole and briefly describe non - drillable material.
(Use Reverse Side of Form if more space is needed.)

30. LIST ALL OPEN HOLD AND/OR PERFORATED INTERVALS

FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO

I have knowledge that the cementing operations, as reflected by the information found on this form, were performed as indicated by such imformation.

* Designates items to be completed by Cementing Company. Items not so designated shall be completed by Operator.

BILLY F. YANDELL 11/2/96 B.F. Yandell
Signature of Cementer or Authorized Representative

HALLIBURTON ENERGY SERVICES
Name of Cementing Company

CERTIFICATE

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

REPRESENTATIVE OF COMPANY | TITLE | DATE | Phone A/C NUMBER

SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

Plugging Record

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

FORM W-3
Rev. 12/92

API NO. (if available)

1. RRC District

FILE IN DUPLICATE WITH DISTRICT OFFICE OF DISTRICT IN WHICH WELL IS LOCATED WITHIN THIRTY DAYS AFTER PLUGGING

4. RRC Lease or Id. Number

2. FIELD NAME (as per RRC Records)

3. Lease Name: Hoechst Celanese

5. Well Number: 4

6. OPERATOR

6a. Original Form W-1 Filed in Name of:

10. County

7. ADDRESS

6b. Any Subsequent W-1's Filed in Name of:

11. Date Drilling Permit Issued

8. Location of Well, Relative to Nearest Lease Boundaries of Lease on which this Well is Located: Feet From ____ Line and ____ Feet From ____ Line of the ____ Lease

12. Permit Number

9a. SECTION, BLOCK, AND SURVEY

9b. Distance and Direction From Nearest Town in this County

13. Date Drilling Commenced

16. Type Well (Oil, Gas, Dry)

Total Depth

17. If Multiple Completion List All Field Names and Oil Lease or Gas ID No.'s

GAS ID or OIL LEASE #	Oil - O Gas - G	WELL #

14. Date Drilling Completed

18. If Gas, Amt. of Cond. on Hand at time of Plugging

15. Date Well Plugged

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7	PLUG #8
*19. Cementing Date	10/13/96							
20. Size of Hole or Pipe in which Plug Placed (inches)								
21. Depth to Bottom of Tubing or Drill Pipe (ft.)								
*22. Sacks of Cement Used (each plug)	150							
*23. Slurry Volume Pumped (cu. ft.)	163.5							
*24. Calculated Top of Plug (ft.)	2531							
25. Measured Top of Plug (if tagged) (ft.)								
*26. Slurry Wt. #/Gal.	16.2							
*27. Type Cement PREMIUM	NEAT							

28. CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT. #/FT.	PUT IN WELL (ft.)	LEFT IN WELL (ft.)	HOLE SIZE (in.)

29. Was any Non-Drillable Material (Other than Casing) Left in This Well ☐ Yes ☐ No

29a. If answer to above is "Yes" state depth to top of "junk" left in hole and briefly describe non-drillable material. (Use Reverse Side of Form if more space is needed.)

30. LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO

I have knowledge that the cementing operations, as reflected by the information found on this form, were performed as indicated by such information.

* Designates items to be completed by Cementing Company. Items not so designated shall be completed by Operator.

Michael Patek
Signature of Cementer or Authorized Representative

Halliburton Energy Services
Name of Cementing Company

CERTIFICATE

I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

Michael Patek	Service Supervisor	10/13/96	Phone 800	223-0898
REPRESENTATIVE OF COMPANY	TITLE	DATE	A/C	NUMBER

SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

CEMENTING TO PLUG AND ABANDON	PLUG # 1	PLUG # 2	PLUG # 3	PLUG # 4	PLUG # 5	PLUG # 6	PLUG # 7	PLUG # 8
23. Cementing date	10/13/96							
24. Size of hole or pipe plugged (in.)								
25. Depth to bottom of tubing or drill pipe (ft.)								
26. Sacks of cement used (each plug)	150							
27. Slurry volume pumped (cu. ft.)	163.5							
28. Calculated top of plug (ft.)	2531							
29. Measured top of plug, if tagged (ft.)								
30. Slurry wt. (lbs/gal)	16.2							
31. Type cement	Prem-Neat							

CEMENTER'S CERTIFICATE: I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that the cementing of casing and/or the placing of cement plugs in this well as shown in the report was performed by me or under my supervision, and that the cementing data and facts presented on both sides of this form are true, correct, and complete, to the best of my knowledge. This certification covers cementing data only.

Michael Patek Service Supervisor Halliburton Energy Services Michael Patek

Name and title of cementer's representative | Cementing Company | Signature

P.O. BOX 1172 Fresno , TX 77545 | 800 223-0898 | 10/13/96

Address | City, State, Zip Code | Tel.: Area Code Number | Date: mo. day yr.

OPERATOR'S CERTIFICATE: I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that I have knowledge of the well data and information presented in this report, and that data and facts presented on both sides of this form are true, correct, and complete, to the best of my knowledge. This certification covers all well data.

Typed or printed name of operator's representative | Title | Signature

Address | City, State, Zip Code | Tel.: Area Code Number | Date: mo. day yr.

Instructions to Form W-15, Cementing Report

IMPORTANT: Operators and cementing companies must comply with the requirements of the Commission's Statewide Rules 8 (Water Protection), 13 (Casing, Cementing, Drilling, and Completion), and 14 (Well Plugging). For **offshore** operations, see the requirements of Rule 13 (c).

A. **What to file.** An operator should file an original and one copy of the completed Form W-15 for each cementing company used on a well. The cementing of different casing strings on a well by one cementing company may be reported on one form. Form W-15 should be filed with the following:

- An initial oil or gas completion report, **Form W-2 or G-1**, as required by Statewide or special field rules;
- Form **W-4**, Application for Multiple Completion, if the well is a multiple parallel casing completion; and
- Form **W-3**, Plugging Record, unless the W-3 is signed by the cementing company representative. When reporting **dry** holes, operators must complete Form **W-15, in addition to Form W-3, to show any casing cemented in the hole.**

B. **Where to file.** The appropriate Commission District Office for the county in which the well is located.

C. **Surface casing.** An operator must set and cement sufficient surface casing to protect all usable-quality water strata, as defined by the Texas Department of Water Resources, Austin. Before drilling a well in any field or area in which no field rules are in effect or in which surface casing requirements are not specified in the applicable rules, an operator must obtain a letter from the Department of Water Resources stating the protection depth. Surface casing should not be set deeper than 200 feet below the specified depth without prior approval from the Commission.

D. **Centralizers.** Surface casing must be centralized at the shoe, above and below a stage collar or diverting tool, if run, and through usable-quality water zones. In nondeviated holes, a centralizer must be placed every fourth joint from the cement shoe to the ground surface or to the bottom of the cellar. All centralizers must meet API specifications.

E. **Exceptions and alternative casing programs.** The District Director may grant an exception to the requirements of Statewide Rule 13. In a written application, an operator must state the reason for the requested exception and outline an alternate program for casing and cementing through the protection depth for strata containing usable-quality water. The District Director may approve, modify, or reject a proposed program. **An operator must obtain approval of any exception before beginning casing and cementing operations.**

F. **Intermediate and production casing.** For specific technical requirements, operators should consult Statewide Rule 13 (b) (3) and (4).

G. **Plugging and abandoning.** Cement plugs must be placed in the wellbore as required by Statewide Rule 14. The District Director may require additional cement plugs. For onshore or inland wells, a 10-foot cement plug must be placed in the top of the well, and the casing must be cut off three feet below the ground surface. All cement plugs, except the top plug, must have sufficient slurry volume to fill 100 feet of hole, plus ten percent for each 1,000 feet of depth from the ground surface to the bottom of the plug.

To plug and abandon a well, operators must use only cementers approved by the Director of Field Operations. Cementing companies, service companies, or operators can qualify as approved cementers by demonstrating that they are able to mix and pump cement in compliance with Commission rules and regulations.

Plugging Record

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

FORM W-3
Rev. 12/92

API NO. (if available)

1. RRC District

FILE IN DUPLICATE WITH DISTRICT OFFICE OF DISTRICT IN WHICH WELL IS LOCATED WITHIN THIRTY DAYS AFTER PLUGGING

4. RRC Lease or Id. Number

2. FIELD NAME (as per RRC Records): Bay City

3. Lease Name: Hoechst Celanese

5. Well Number: 49-4

6. OPERATOR: ECO Solutions

6a. Original Form W-1 Filed in Name of:

10. County: Matagorda

7. ADDRESS

6b. Any Subsequent W-1's Filed in Name of:

11. Date Drilling Permit Issued

8. Location of Well, Relative to Nearest Lease Boundaries of Lease on which this Well is Located: Feet From ____ Line and ____ Feet From ____ Line of the ____ Lease

12. Permit Number

9a. SECTION, BLOCK, AND SURVEY

9b. Distance and Direction From Nearest Town in this County

13. Date Drilling Commenced

16. Type Well (Oil, Gas, Dry)

Total Depth

17. If Multiple Completion List All Field Names and Oil Lease or Gas ID No.'s

GAS ID or OIL LEASE #	Oil - O Gas - G	WELL #

14. Date Drilling Completed

18. If Gas, Amt. of Cond. on Hand at time of Plugging

15. Date Well Plugged

CEMENTING TO PLUG AND ABANDON DATA:	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7	PLUG #8
*19. Cementing Date	10/16	10/17/96						
20. Size of Hole or Pipe in which Plug Placed (inches)								
21. Depth to Bottom of Tubing or Drill Pipe (ft.)								
*22. Sacks of Cement Used (each plug)	370	30						
*23. Slurry Volume Pumped (cu. ft.)	403	32.7						
*24. Calculated Top of Plug (ft.)	Surface	Surface						
25. Measured Top of Plug (if tagged) (ft.)								
*26. Slurry Wt. #/Gal.	16.2	16.2						
*27. Type Cement 1/4#/SK Flocele	Prem	Neat						

28. CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT. #/FT.	PUT IN WELL (ft.)	LEFT IN WELL (ft.)	HOLE SIZE (in.)

29. Was any Non-Drillable Material (Other than Casing) Left in This Well ☐ Yes ☐ No

29a. If answer to above is "Yes" state depth to top of "junk" left in hole and briefly describe non-drillable material. (Use Reverse Side of Form if more space is needed.)

30. LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS

FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO
FROM	TO	FROM	TO

I have knowledge that the cementing operations, as reflected by the information found on this form, were performed as indicated by such information.
* Designates items to be completed by Cementing Company. Items not so designated shall be completed by Operator.

Signature of Cementer or Authorized Representative

Halliburton Energy Services
Name of Cementing Company

CERTIFICATE:
I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this report, that this report was prepared by me or under my supervision and direction, and that data and facts stated therein are true, correct, and complete, to the best of my knowledge.

Michael Supak	Service Supervisor	10/17/96	Phone 800	223-0898
REPRESENTATIVE OF COMPANY	TITLE	DATE	A/C	NUMBER

SIGNATURE: REPRESENTATIVE OF RAILROAD COMMISSION

Cementer: Fill in shaded areas.
Operator: Fill in other items.

Form W-15
Cementing Report
Rev. 4/1/83
483-045

RAILROAD COMMISSION OF TEXAS
Oil and Gas Division

1. Operator's Name (As shown on Form P-5, Organization Report)	2. RRC Operator No.	3. RRC District No.	4. County of Well Site
ECO Solutions			Matagorda

5. Field Name (Wildcat or exactly as shown on RRC records)	6. API No.	7. Drilling Permit No.
Bay City	42-	

8. Lease Name	9. Rule 37 Case No.	10. Oil Lease/Gas ID No.	11. Well No.
Hoechst Celanese			49-4

CASING CEMENTING DATA:		SURFACE CASING	INTER-MEDIATE CASING	PRODUCTION CASING		MULTI-STAGE CEMENTING PROCESS	
				Single String	Multiple Parallel Strings	Tool	Shoe
12. Cementing Date							
13. •Drilled hole size							
•Est. % wash or hole enlargement							
14. Size of casing (in. O.D.)							
15. Top of liner (ft.)							
16. Setting depth (ft.)							
17. Number of centralizers used							
18. Hrs. waiting on cement before drill-out							
1st Slurry	19. API cement used: No. of sacks ▶						
	Class ▶						
	Additives ▶						
2nd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
3rd Slurry	No. of sacks ▶						
	Class ▶						
	Additives ▶						
1st	20. Slurry pumped: Volume (cu. ft.) ▶						
	Height (ft.) ▶						
2nd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
3rd	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
Total	Volume (cu. ft.) ▶						
	Height (ft.) ▶						
21. Was cement circulated to ground surface (or bottom of cellar) outside casing?							

22. Remarks

OVER ▶

CEMENTING TO PLUG AND ABANDON	PLUG # 1	PLUG # 2	PLUG # 3	PLUG # 4	PLUG # 5	PLUG # 6	PLUG # 7	PLUG # 8
23. Cementing date	10/16/96	10/17/96						
24. Size of hole or pipe plugged (in.)								
25. Depth to bottom of tubing or drill pipe (ft.)								
26. Sacks of cement used (each plug)	370	30						
27. Slurry volume pumped (cu. ft.)	403	32.7						
28. Calculated top of plug (ft.)	Surface	Surface						
29. Measured top of plug, if tagged (ft.)								
30. Slurry wt. (lbs/gal)	16.2	16.2						
31. Type cement	Prem	Neat						

1/4 Flocele/SK)

CEMENTER'S CERTIFICATE: I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that the cementing of casing and/or the placing of cement plugs in this well as shown in the report was performed by me or under my supervision, and that the cementing data and facts presented on both sides of this form are true, correct, and complete, to the best of my knowledge. This certification covers cementing data only.

Michael Supak Service Supervisor Halliburton Energy Services

Name and title of cementer's representative | Cementing Company | Signature

P.O. Box 1172 Fresno, Tx 77545 | 800 223-0898 | 10/17/96

Address | City, State, Zip Code | Tel.: Area Code Number | Date: mo. day yr.

OPERATOR'S CERTIFICATE: I declare under penalties prescribed in Sec. 91.143, Texas Natural Resources Code, that I am authorized to make this certification, that I have knowledge of the well data and information presented in this report, and that data and facts presented on both sides of this form are true, correct, and complete, to the best of my knowledge. This certification covers all well data.

Typed or printed name of operator's representative | Title | Signature

Address | City, State, Zip Code | Tel.: Area Code Number | Date: mo. day yr.

Instructions to Form W-15, Cementing Report

MPORTANT: Operators and cementing companies must comply with the requirements of the Commission's Statewide Rules 8 (Water Protection), 13 (Casing, Cementing, Drilling, and Completion), and 14 (Well Plugging). For **offshore** operations, see the requirements of Rule 13 (c).

A. **What to file.** An operator should file an original and one copy of the completed Form W-15 for each cementing company used on a well. The cementing of different casing strings on a well by one cementing company may be reported on one form. Form W-15 should be filed with the following:

- An initial oil or gas completion report, **Form W-2 or G-1**, as required by Statewide or special field rules;
- Form W-4, Application for Multiple Completion, if the well is a multiple parallel casing completion; and
- Form W-3, Plugging Record, unless the W-3 is signed by the cementing company representative. When reporting **dry** holes, operators must complete Form **W-15, in addition to Form W-3, to show any casing cemented in the hole.**

3. **Where to file.** The appropriate Commission District Office for the county in which the well is located.

C. **Surface casing.** An operator must set and cement sufficient surface casing to protect all usable-quality water strata, as defined by the Texas Department of Water Resources, Austin. Before drilling a well in any field or area in which no field rules are in effect or in which surface casing requirements are not specified in the applicable rules, an operator must obtain a letter from the Department of Water Resources stating the protection depth. Surface casing should not be set deeper than 200 feet below the specified depth without prior approval from the Commission.

D. **Centralizers.** Surface casing must be centralized at the shoe, above and below a stage collar or diverting tool, if run, and through usable-quality water zones. In nondeviated holes, a centralizer must be placed every fourth joint from the cement shoe to the ground surface or to the bottom of the cellar. All centralizers must meet API specifications.

E. **Exceptions and alternative casing programs.** The District Director may grant an exception to the requirements of Statewide Rule 13. In a written application, an operator must state the reason for the requested exception and outline an alternate program for casing and cementing through the protection depth for strata containing usable-quality water. The District Director may approve, modify, or reject a proposed program. **An operator must obtain approval of any exception before beginning casing and cementing operations.**

F. **Intermediate and production casing.** For specific technical requirements, operators should consult Statewide Rule 13 (b) (3) and (4).

G. **Plugging and abandoning.** Cement plugs must be placed in the wellbore as required by Statewide Rule 14. The District Director may require additional cement plugs. For onshore or inland wells, a 10-foot cement plug must be placed in the top of the well, and the casing must be cut off three feet below the ground surface. All cement plugs, except the top plug, must have sufficient slurry volume to fill 100 feet of hole, plus ten percent for each 1,000 feet of depth from the ground surface to the bottom of the plug.

To plug and abandon a well, operators must use only cementers approved by the Director of Field Operations. Cementing companies, service companies, or operators can qualify as approved cementers by demonstrating that they are able to mix and pump cement in compliance with Commission rules and regulations.

APPENDIX C

CORRESPONDENCE

File ECO Jun 96014

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

June 28, 1996

I. O. Coleman, Jr.
Hoechst Celanese, Chemical Group
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, TX 77404-0509

Re: Approval of Closure Procedures, Permits No. WDW-32 and WDW-49, Bay City, Texas

Dear Mr. Coleman, Jr.:

The staff has reviewed your letter of June 10 detailing the closure procedures previously approved January 8, 1996 of the above referenced wells and finds that it meets the requirements outlined in 30 TAC §331.46 (Closure Standards). Please submit the Closure Report as required by §331.46(m) within 30 days of completion of closure of the final well since both wells will be closed during the continuous series using the same equipment. Please also provide evidence of the deed recording as required by §331.46(l) prior to a request of revocation of the permit.

Your letter also certifies that neither well had been operated since the last MIT in October, 1995 for WDW-32 and in March, 1996 for WDW-49, and staff agrees that will suffice as final MIT testing prior to closure.

It is also requested that we be kept up-dated on the exact date of closure operations so that a staff member may schedule to be present. Questions regarding this matter should be directed to me at (512) 239-6196, correspondence may be sent to me at Mail Code, MC-131 at the TNRCC address.

Sincerely,

Jim L. Boswell, Permit Coordinator
Underground Injection Control Team
UIC, Uranium, & Radioactive Waste Section
Industrial & Hazardous Waste Division

cc: Brian Graves, EPA Region 6

960 14

Hoechst Celanese

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

June 10, 1996
IOC-033-96

FEDERAL EXPRESS

Mr. Jim L. Boswell, Permit Coordinator
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
TX Natl Resource Conservation Commission
12100 Park 35 Circle
Austin, TX 78753

RE: Closure Procedures for Class I Injection Wells
WDW-32 (Plant Well #2) and WDW-49 (Plant Well #4)
Hoechst Celanese Chemical Group, Ltd.
Bay City Plant, Bay City, TX

Dear Mr. Boswell:

Hoechst Celanese Chemical Group, Ltd. hereby submits the attached closure procedures (2 copies) for Class I Injection Wells WDW-32 (Well #3) and WDW-49 Well #4) located at the Bay City Plant. The attached information is intended to update the closure plans previously approved by the TNRCC on January 8, 1996.

We propose to conduct field operations in a continuous series of events with a minimal delay as equipment is moved from Injection Well WDW-32 to Injection Well WDW-49. As documented in the attached schedule, field operations should start early in September, 1996.

You will be advised as the work plans and schedule are finalized. If you have any questions, please call me at 409-241-4197.

Sincerely,

I. O. Coleman, Jr.
Staff Environmental Chemist

IOC/cjs
attachment

Hoechst

cc: w/o attachment

Mr. Ben Knape, Chief
Underground Injection Control Unit
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
TX Natl Resource Conservation Commission
P. O. Box 13087ircle
Austin, TX 78711-3087

Mr. Charles J. Green, Geologist
TX Natl Resource Conservation Comm.
Underground Injection Control Team
UIC, Uranium & Radioactive Waste Section
Industrial and Hazardous Waste Division
P. O. Box 13087
Austin, TX 78711-3087

bcc: w/o attachment
Via e-mail

C. R. Pennington
W.G. Cornman
D. Peters
B. L. Fritz
B. R. Hightower
J. V. Anderson
C. J. Griffith
R. S. O'Neal

Mr. Tom Jones
ECO Solutions, Inc.
9800 Richmond Ave. , Ste 320
Houston, TX 77042-4519

bcc: w/attachment

W. E. Dentler → P. H. Richardson → R. J. Johnston → G. J. McCarthy
H. R. Horton → B. S. Barrington
A. Conley-Pitchell - Bridgewater
Environmental File No.: 203.20

HOECHST CELANESE CHEMICAL GROUP, LTD.

CLOSURE PROCEDURES AND SCHEDULE

INJECTION WELLS

WDW-32 (WELL #3) AND WDW-49 (WELL #4)

ECO Solutions, Inc.
9800 Richmond Avenue
Suite 320
Houston, TX 77042
(713) 780-1955
Fax (713) 780-1955

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HOECHST CELANESE CHEMICAL GROUP, LTD.
CLOSURE PLAN FOR INJECTION WELLS
WDW-32 (WELL #3) AND WDW-49 (WELL #4)

BACKGROUND

In a letter to Hoechst Celanese Chemical Group, Ltd. (Hoechst Celanese) dated January 8, 1996, the Texas Natural Resource Conservation Commission (TNRCC) granted approval to the closure plans for Class I injection wells WDW-14, WDW-32, WDW-49 and WDW-110 located at the Bay City Plant. Field operations to close injection well WDW-14 (well #2) were completed on March 13, 1996.

Hoechst Celanese plans to properly close two (2) of the remaining three (3) Class I injection wells starting in September, 1996. Injection well WDW-32 (well #3) will be closed first and injection well WDW-49 (well #4) closed second. It is planned that the field operations associated with these two well closures will be accomplished as a single continuous sequence of events with little delay as the equipment is moved from one well location to the next.

Two (2) closure plans are attached which follow the procedures previously approved by the TNRCC. The only changes reflect the site specific conditions and depths unique to each well. Although no additional regulatory approvals are required, the attached plans are submitted for your information. A preliminary closure schedule is also attached. Well schematics were included with the original closure plan submitted to the TNRCC and have not changed.

MECHANICAL INTEGRITY TESTING

As stated in the January 8, 1996 TNRCC approval letter, WDW-14 (well #2) required no additional mechanical integrity testing since the well had not operated following its last successful mechanical integrity demonstration. Hoechst Celanese requests that the TNRCC confirm that no additional mechanical integrity testing will be required on WDW-32 (well #3) and WDW-49 (well #4). The last mechanical integrity and falloff testing was completed on WDW-32 (well #3) in October, 1995 and on WDW-49 (well #4) in March, 1996. Both injection wells were brined in and the flowlines disconnected following the testing. No waste injection has occurred since those dates.

SUBMITTAL OF CLOSURE REPORT

As required by 30 TAC §331.46(m), the closure report must be submitted within 30 days of completion of closure. A clarification is requested on the timing of the closure report. Since injection wells WDW-32 (well #3) and WDW-49 (well #4) are to be closed in a continuous sequence of field operations, it is requested that the closure reports for both wells be submitted 30 days following the completion of closure of the second well, or WDW-49 (well #4). This schedule will allow the field certification information to be obtained and integrated into the respective reports in a timely manner.

INJECTION WELL WDW-32 (WELL # 3)
CLOSURE PROCEDURES

1) Prepare well location for field operations. Remove flow lines, monitoring equipment, and instrumentation. Line and dike surface area surrounding wellsite in the area where the workover rig, pumps, tanks and pipe racks will be placed.

2) Notify TNRCC representative of anticipated start of field operations.

3) Move in and rig up workover rig and peripheral equipment.

4) Pull seal assembly out of packer and triple rinse injection string and flush annular area with 9.8 ppg brine.

5) Pull out of the hole laying down injection string and TIW seal assembly on pipe racks. HCCG personnel will remove injection string and TIW seal assembly from wellsite.

6) Pick up casing scraper and work string. Go in hole with casing scraper to the top of the injection packer at 3192' ±. Pull out of the hole with same.

7) Move in and rig up wireline unit to set cement retainer. Pick up junk basket and gauge ring and go in the hole to the top of the injection packer. Pull out of the hole with the junk basket and gauge ring. Go in the hole with wireline set cast iron cement retainer and set inside the 9+5/8" casing at 3182' ±, or approximately 10' above the top of the injection packer. Pull out of the hole and rig down wireline unit.

8) Notify TNRCC representative 24 hours prior to start of cementing operations to witness placement of cement plugs.

9) Pick-up cement retainer shifting assembly with work string and go in the hole with same. Engage cement retainer with shifting assembly and test annulus to 500 psi to confirm that the cement retainer is properly set.

10) Rig up Halliburton, or equivalent service company, to squeeze cement (permanently abandon) the injection zone. Pumping through retainer fill injection interval with high compressive strength cement slurry. Close cement retainer and disengage from same. Leave a 50' ± column of cement above cement retainer and pull out of the hole with shifting assembly.

11) Pick up section mill and drill collars on work string and go in the hole with same. Mill out approximately 50' section of 9+5/8" casing above the top of the cement column. Pull out of the hole and remove section mill.

12) Pick up underreamer and drill collars and go in the hole with same. Underream sectioned interval out to approximately 14" diameter borehole. Pull out of the hole with underreamer.

13) Go in the hole open-ended to set cement plug #2. The plug will extend up across the sectioned interval and an additional 300' - 400' above the section. Rig up Halliburton, or equivalent, and set balanced cement plug with high compressive strength cement. Pull out of the hole and wait on cement plug #2 to cure (approximately 12 hours).

14) Go in the hole with 8+3/4" drill bit and drill pipe to confirm the top of the cement. "Dress off" top of plug #2 to confirm cement has had sufficient time to properly cure.

15) Rig up Halliburton, or equivalent, and set cement plug #3 with high compressive strength cement. Set balanced cement plug. Cement column to extend from the previous plug up to 1500' ± or approximately 200' beneath the base of surface casing. Pull out of the hole and wait on cement plug #3 to cure (approximately 12 hours).

16) Go in the hole with 8+3/4" drill bit and drill pipe to confirm the top of cement column. "Dress off" the top of plug #3 to confirm that cement has had sufficient time to properly cure. Pull out of the hole.

17) Move in and rig up wireline truck to perforate for squeeze job at the base of the surface casing. Perforate the protection casing 2' at 4 shots per foot (8 shots) with top at 1312' ±, or approximately 10' beneath the surface casing seat at 1302' ±. Pull out of the hole and rig down wireline unit.

18) Rig up Halliburton, or equivalent, and set cement plug #4 with high compressive strength cement. Set balanced cement plug. Cement column will extend from the top of plug #3 back to the surface. Pull out of the hole. Apply pressure to cement column to squeeze cement out through the perforations. Wait on cement plug #4 to cure (approximately 12 hours).

19) Go in the hole with 8+3/4" drill bit and drill pipe to confirm the top of cement column. "Dress off" the top of plug #4 to confirm that cement has had sufficient time to properly cure. Fill balance of protection casing with high compressive strength cement as required. Pull out of the hole and lay down work string. Wash out blowout preventors.

20) Rig down and release workover rig. Cut off casings at grade and weld 1/2" steel plate over all casing strings. Inscribe plate with well identification and other pertinent data as required.

21) Prepare summary report for submittal to TNRCC and USEPA Region 6.

INJECTION WELL WDW-49 (WELL # 4)
CLOSURE PROCEDURES

1) Prepare well location for field operations. Remove flow lines, monitoring equipment, and instrumentation. Line and dike surface area surrounding wellsite in the area where the workover rig, pumps, tanks and pipe racks will be placed.

2) Notify TNRCC representative of anticipated start of field operations.

3) Move workover rig and peripheral equipment from WDW-32 (well #3) to WDW-49 (well #4)

4) Pull seal assembly out of packer and triple rinse injection string and flush annular area with 9.8 ppg brine.

5) Pull out of the hole laying down injection string and TIW seal assembly on pipe racks. HCCG personnel will remove injection string and TIW seal assembly from wellsite.

6) Pick up casing scraper and work string. Go in hole with casing scraper to the top of the injection packer at 3316' ±. Pull out of the hole with same.

7) Move in and rig up wireline unit to set cement retainer. Pick up junk basket and gauge ring and go in the hole to the top of the injection packer. Pull out of the hole with the junk basket and gauge ring. Go in the hole with wireline-set cast iron cement retainer and set inside the 7+5/8" casing at 3306' ±, or approximately 10' above the top of the injection packer. Pull out of the hole and rig down wireline unit.

8) Notify TNRCC representative 24 hours prior to start of cementing operations to witness placement of cement plugs.

9) Pick-up cement retainer shifting assembly with work string and go in the hole with same. Engage cement retainer with shifting assembly and test annulus to 500 psi to confirm that the cement retainer is properly set.

10) Rig up Halliburton, or equivalent service company, to squeeze cement (permanently abandon) the injection zone. Pumping through retainer fill injection interval with high compressive strength cement slurry. Close cement retainer and disengage from same. Leave a 50' ± column of cement above cement retainer and pull out of the hole with shifting assembly.

11) Pick up section mill and drill collars on work string and go in the hole with same. Mill out approximately 50' section of 7+5/8" casing above the top of the cement column. Pull out of the hole and remove section mill.

12) Pick up underreamer and drill collars and go in the hole with same. Underream sectioned interval out to approximately 10" diameter borehole. Pull out of the hole with underreamer.

13) Go in the hole open-ended to set cement plug #2. The plug will extend up across the sectioned interval and an additional 300' - 400' above the section. Rig up Halliburton, or equivalent, and set balanced cement plug with high compressive strength cement. Pull out of the hole and wait on cement plug #2 to cure (approximately 12 hours).

14) Go in the hole with 6 ¾" drill bit and drill pipe to confirm the top of the column of cement. "Dress off "top of plug #2 to confirm cement has had sufficient time to properly cure.

15) Rig up Halliburton, or equivalent, and set cement plug #3 with high compressive strength cement. Set balanced cement plug. Cement column to extend from the previous plug up to 1500' ±, or approximately 200' beneath the base of surface casing. Pull out of the hole and wait on cement plug #3 to cure (approximately 12 hours).

16) Go in the hole with 6+¾" drill bit and drill pipe to confirm the top of cement column. "Dress off" the top of plug #3 to confirm that cement has had sufficient time to properly cure. Pull out of the hole.

17) Move in and rig up wireline truck to perforate for squeeze job at the base of the surface casing. Perforate the protection casing 2' at 4 shots per foot (8 shots) with top at 1400' ± or approximately 10' beneath the surface casing seat at 1389' ±. Pull out of the hole and rig down wireline unit.

18) Rig up Halliburton, or equivalent, and set cement plug #4 with high compressive strength cement. Set balanced cement plug. Cement column will extend from the top of plug #3 back to the surface. Pull out of the hole. Apply pressure to cement column to squeeze cement out through the perforations. Wait on cement plug #4 to cure (approximately 12 hours).

19) Go in the hole with 6 ¾" drill bit and drill pipe to confirm the top of cement column. "Dress off' the top of plug #4 to confirm that cement has had sufficient time to properly cure. Fill balance of protection casing with high compressive strength cement as required. Pull out of the hole and lay down work string. Wash out blowout preventors.

20) Rig down and release workover rig. Cut off casings at grade and weld 1/2" steel plate over all casing strings. Inscribe plate with well identification and other pertinent data as required.

21) Prepare summary report for submittal to TNRCC and USEPA Region 6.

22) Project Complete

ATTACHMENT 1

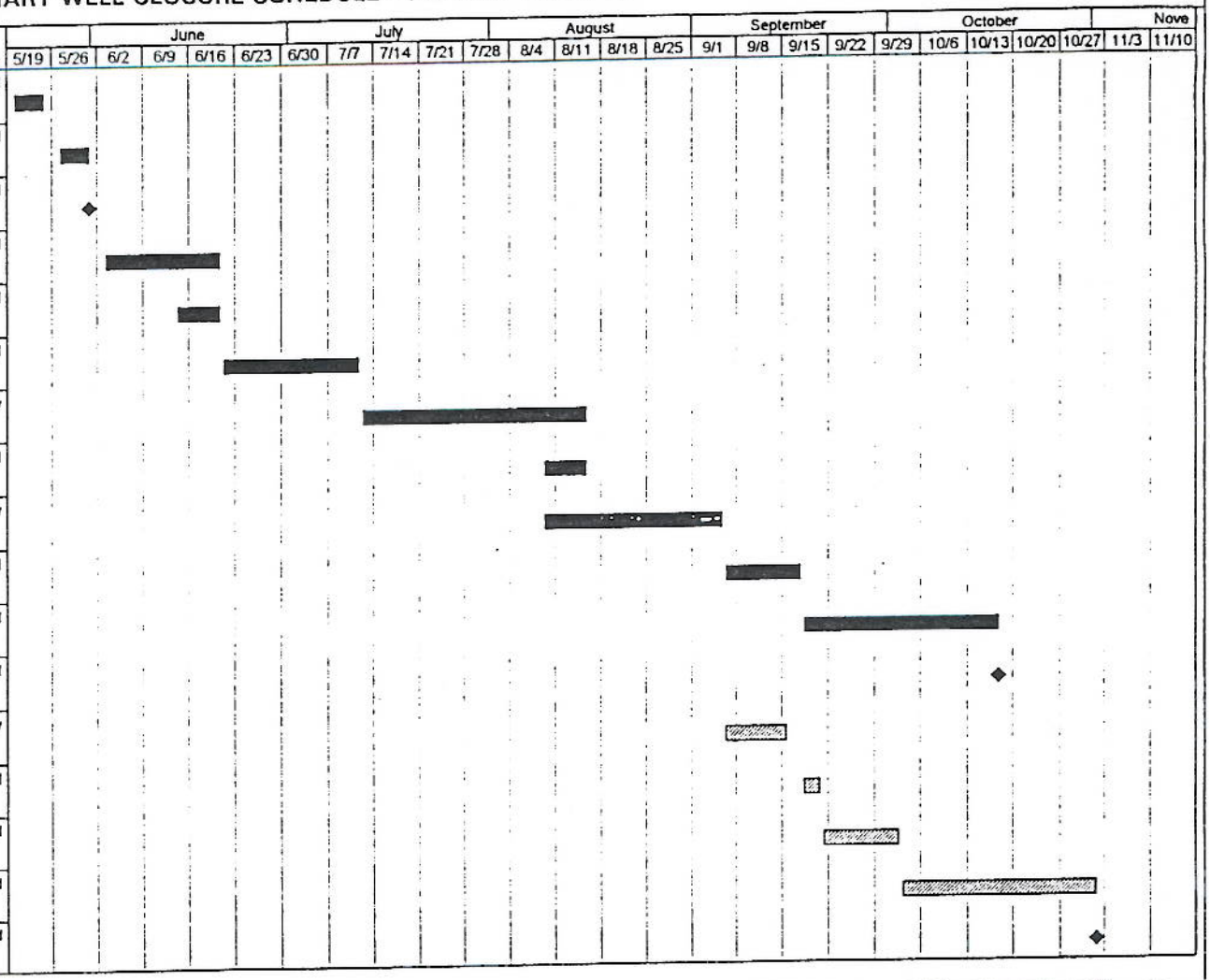
CLOSURE SCHEDULE

WDW-32 (WELL #3)

WDW-49 (WELL #4)

HOECHST CELANESE CHEMICAL GROUP, LTD
BAY CITY, TEXAS PLANT
PRELIMINARY WELL CLOSURE SCHEDULE - WDW-32 WDW-49

NO.	Name	Work Days
1	Prepare updated closure procedures for TNRCC	5d
2	Review by HCCG & finalize by ECO	5d
3	Submit Procedures To TNRCC	0d
4	TNRCC Review and approval	14d
5	Solicit Vendor Quotes	5d
6	Obtain Vendor Quotes - Prepare final recommendations	15d
7	Identify rig availability & schedule	5w
8	Finalize procedures cost & schedule	5d
9	Site Preparations For Field Operations	4w
10	Field Operations To Close WDW-32	12d
11	Prepare Final Closure Report	30d
12	Submit Final Closure Report To TNRCC	0d
13	Prepare location for closure operations	2w
14	Move rig & equipment to WDW-49	3d
15	Field Operations To Close WDW-49	12d
16	Prepare Final Closure Report	30d
17	Submit Final Closure Report To TNRCC	0d



APPENDIX D
FINAL MECHANICAL INTEGRITY TESTING REPORT (TEXT ONLY)
WDW-32 (WELL #3)

ECO SOLUTIONS, INC.

Hoechst Celanese Chemical Group, Inc.
Bay City Plant
Mechanical Integrity Testing
For WDW-49 (Well No. 4)

ECO Solutions, Inc
10333 Richmond
Suite 250
Houston, Texas 77042
(713) 780-1955

January 1995

ECO Job No. 95016

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APPENDICES

1.0 INTRODUCTION AND EXECUTIVE SUMMARY

1.0 INTRODUCTION

Hoechst Celanese Chemical Group, Inc. (HCCG) contracted ECO Solutions, Inc. (ECO) to perform the annual mechanical integrity testing on their Class I nonhazardous waste disposal well, WDW-49 (Plant Well No. 4), located at their Bay City facility. A schematic drawing of the well is included as Figure 1. The attached report details the data and test results associated with the tests.

The following provides an overview of the key elements of the testing on WDW-49 (Well No. 4).

- An Annulus pressure test (APT) was conducted to satisfy the annual mechanical integrity test (MIT) requirements of the Texas Natural Resource Conservation Commission (TNRCC).
- A Radioactive tracer (RAT) survey was conducted to satisfy the annual MIT requirements of the TNRCC.
- A pressure falloff test was conducted to satisfy the annual ambient monitoring requirements of the U.S. Environmental Protection Agency (EPA) and the TNRCC.

The APT and RAT on WDW-49 (Well No. 4) were conducted on Thursday, March 9, 1995, and witnessed by Mr. Wesley Smith of ECO and Mr. Ray Horton of HCCG.

1.2 EXECUTIVE SUMMARY

WDW-49 (Well No. 4) successfully passed the 1995 MIT conducted between March 6 and 9, 1995.

Radioactive Tracer Survey

The analysis of the RAT survey performed on March 9, 1995 demonstrated that no upward fluid movement from the injection interval is occurring. The RAT checked for upward fluid movement using three separate methods. All three tests showed no evidence of upward migration. This interpretation was supported by an independent evaluation provided by Western Atlas Logging Services (Atlas) and is included in Appendix A together with the RAT log.

The results of the radioactive tracer survey run on 3/9/95 were analyzed by ECO and Atlas. No anomalies were detected on any of the logging runs which would indicate a loss of mechanical integrity. Each part of the survey is discussed in detail in Section 3.0.

Annulus Pressure Test

A demonstration of internal mechanical integrity was supported by an APT conducted on March 9, 1995. The annulus was pressurized to a maximum of 1100 pounds per square inch gauge (psig). The APT was monitored for thirty minutes. During the 30 minutes the pressure loss was measured from 1098 to 1094 psig, or 4 pounds per square inch (psi) (0.37%), which is well within the 5% pressure loss criteria set by the TNRCC. The APT data and plot is included in Appendix B.

Bottom Hole Pressure Falloff Testing

The pressure fall-off test on WDW-49 was conducted on Wednesday and Thursday, March 8 and 9, 1995. The testing was supervised by Mr. Reuben Alaniz of ECO and witnessed by Mr. Ray Horton of HCCG. WDW-49 (Well No. 4) was diagnosed to be injecting into a homogeneous reservoir with a calculated permeability of **1531.08 md** and skin damage of **+48.95** utilizing an h_{net} value of **85 feet**. The flow efficiency of 15.57% suggests that the near wellbore conditions have a large affect on the injection volume limitations and that the total pressure drop is primarily due to formation damage within a small radius from the well.

2.0 FIELD OPERATIONS SUMMARY

Monday, March 6,1995

Mr. Rueben Alaniz of ECO arrived at HCCG Bay City Plant and met with Milton Cooke Electric Line crew. Checked in with security and moved out to well site. Well injecting at 198 gpm with 460 psig surface pressure. Unable to rig up due to problems with crown valve on tree. Met with Mr. Billy Campbell (shift supervisor) to discuss getting a HCCG crew to change out the valve. Shut well in to change out valve, double block injection line and close master valve. Rigged up Milton Cooke. Began injection into well, bring up to previous injection rate. Run in hole with casing collar locator (CCL), surface readout (SRO) and memory gauge. Ran CCL log and tied into packer at 3316', pulled up and set tool string at 3,000'. Begin monitoring bottom hole injection pressure. All depths herein are measured from rotary drive bushing at twelve (12) feet above ground level.

Tuesday, March 7, 1995

Continue monitoring bottom hole injection pressure. At 0800 hours generated cartesian plot of pressure and temperature. Observed stability of pressure prior to shut-in. Met with HCCG crew to determine time of shut-in. Shift supervisor discussed tank fluid level, rain fall and shut-in period. The quantity of rainfall combined with the tank fluid level and the shut-in period could cause some problems. Met with project manager, Mr. Ray Horton, and the shift supervisor and decided to extend the injection period at an increased injection rate. Brought injection rate up to 285 gpm.

Wednesday, March 8, 1995

Continued to monitor bottom hole injection pressure. Generated cartesian graph of pressure and temperature to check for stability. Pressure and injection rate shown to be stabilized enough to begin fall-off test.

Shut down injection pumps and begin monitoring bottom hole pressure fall-off.

Thursday, March 9, 1995

Continued to monitor bottom hole pressure fall-off until 0800 hours. Downloaded data and generated Semi-Log and Log-Log graphs to determine if enough data had been collected to complete fall-off test. Adequate data had been collected, ended fall-off test. Performed static gradient survey while pulling out of hole. Stops were made at 3745',

3300', 3,000', 2,000', 1,000', 500' and surface. Rigged down Milton Cooke and moved off location.

Mr. Larry Walker and Ms. Kathryn Herzog with the TNRCC arrived onsite at 1000 hours to witness APT and RAT. The annulus was pressured up to 1102 psig at 1030 hours. The APT was monitored for thirty (30) minutes. The pressure loss was measured from 1098 to 1094 psig, or 4 psi (0.37%). At 1300 hours Atlas moved in and rigged up. Ran RAT tool into WDW-49 and tagged bottom at 3433'. Ran base line gamma ray (GR) log, a short GR repeat section to confirm tool repeatability and two statistical checks at 3296' and 3351'. Ran first tracer survey from 2900' to 3431' depicting all injected fluid entering the liner interval. Repeated the tracer survey. Set the RAT tool at 3351' for the first stationary survey, ejected a radioactive (RA) slug and monitored for 15 minutes with no indicated upward flow. Repeated an identical stationary survey with the same results. Ran the final baseline GR survey from 3431' to 2900' to confirm that all injected fluid was moving into the disposal interval. Mr. Larry Walker and Ms. Kathryn Herzog left the wellsite. Pulled the tool out of the hole, rigged down and moved off the location. Returned WDW-49 to HCCG for injection service. Mr. Smith returned to Houston.

3.0 MECHANICAL INTEGRITY TESTING

3.1 ANNULUS PRESSURE TEST

An APT was conducted on Thursday, March 9, 1995 in order to demonstrate internal mechanical integrity. The APT was witnessed by Mr. Ray Horton of HCCG, Mr. Wesley Smith of ECO and Mr. Larry Walker and Ms. Kathryn Herzog of the TNRCC. The annulus was pressurized to a maximum pressure of 1102 psig. The APT was monitored for thirty (30) minutes using a certified calibrated pressure gauge. Calibration certificates are included in Appendix C. The gauge was precalibrated and later checked using a dead weight tester. During the 30 minute APT the pressure loss was measured from 1098 to 1094 psig, or 4 psi (0.37%), which was well within the 5% pressure loss criteria set by the TNRCC. The APT data and a plot is included in Appendix B.

3.2 RADIOACTIVE TRACER SURVEY

On Thursday, March 9, 1995 a RAT survey was conducted by Atlas Logging Services to insure that all fluids are entering the injection interval. Analysis of the RAT showed no upward fluid movement. Atlas and ECO conducted the RAT as follows:

1. Ran initial baseline GR log from 3431' to 3000'.
2. Ran repeat GR log from 3431' to 3300' to confirm tool repeatability.
3. Ran 5-minute statistical checks at 3296' and 3351'.
4. Made multiple pass survey #1 with a RA slug ejected at 2900' and a pump rate of 50 gpm.
5. Made multiple pass survey #2 with a RA slug ejected at 2900' and a pump rate of 50 gpm.
6. Ran stationary survey #1 at 3351'. Watched RA slug pass tool and monitored for 15 minutes. Pump rate 120 gpm.
7. Ran stationary survey #2 at 3351'. Watched RA slug pass tool and monitored for 15 minutes. Pump rate 120 gpm.
8. Ran after survey base log from 3431' to 2900'.

Summary

The results of the radioactive tracer survey conducted on 3/9/95 were analyzed by ECO Solutions, Inc. (ECO) and by Atlas. No anomalies were detected on any of the logging runs which would indicate a loss of mechanical integrity. Each part of the log is discussed in detail below.

Profile Survey

Two (2) separate profile runs were made across the packer and perforated interval within WDW-49 (Well No. 4). Each profile run included five (5) to six (6) separate overlapping passes extending from 2900 ± ft. to 3431 ± ft while pumping at 50 gpm. On the profile runs made below the packer all tracer material moves downward as it is injected into the liner interval.

Time Drive Survey

Two (2) time drives or stationary checks were made on WDW-49 (Well No. 4). This type of survey is the best indicator to determine whether or not upward fluid movement can be observed in the well. The flow rate for the time drive portion of the testing was 120 gpm. The two 15 minute checks were each made at 3351' which is approximately 20' above the top of the screen. No upward movement was observed on any of the time drive surveys. The results of the time drive surveys indicate that WDW-49 (Well No. 4) has external mechanical integrity.

Before and After Baseline Gamma Ray Logs

A comparison of the before and after gamma ray logs were quite similar and no indication of upward movement was depicted.

4.0 BOTTOM HOLE PRESSURE FALL-OFF TEST

4.1 BOTTOM HOLE PRESSURE FALL-OFF ANALYSIS

Purpose of Test: Bottom hole pressure fall-off testing is required annually. The purpose of the test is to calculate the following reservoir characteristics: permeability, skin damage, pressure drop due to skin and flow efficiency.

Analysis Description - Fall-off Test

Method of Interpretation: The following analysis was performed by utilizing both Semi-Log and Log-Log analysis. The Semi-Log curve was generated by plotting the Pressure vs the Superposition time function, utilizing the given rate history. The semi-log straight line was calculated by linear regression through the infinite acting flow period of the curve. The slope **m**, and P_{1hr} values were obtained from this curve and utilized for permeability and skin calculations. The Log-Log curves were generated by plotting ΔP and Pressure derivative vs the Agarwal Equivalent time function, $[t_p \Delta t / (t_p + \Delta t)]$. The log-log curves were simultaneously positioned over Gringarten type curves until a solution match was obtained. Permeability and skin values were calculated from this match and then compared with those obtained from the semi-log analysis.

Semi-Log (Horner): The straight line area of the semi-log curve was identified by first using the 1-1/2 log cycle rule to estimate the end of wellbore storage effects. Secondly, the time of the flat portion from the pressure derivative curve was used in determining the area of the semi-log curve in which the straight line was drawn. The semi-log yielded a slope value of **8.486 psi/cycle** and a P_{1hr} of **1519 psi**. The pressure difference between P_{1hr} and the injection pressure, P_{inj} of **1936 psi** followed with the calculated slope would give indications of positive skin damage and high permeability.

Log Log (Gringarten Type Curves): Development of the unit slope line in the early portion of the derivative curve coupled with the high maximum of the derivative is indicative of a damaged well with wellbore storage. The flattening portion of the derivative curve at 0.5 p_d/p_d' indicated the beginning of the radial flow regime and was observed approximately 9.64 hours into the falloff test. The flat portion of the derivative curve was the main factor used to obtain a tuype curve match yielding similar results to the semi-log analysis.

Conclusions: WDW-49 (Well No. 4) was diagnosed to be injecting into a homogeneous reservoir with a calculated permeability of **1531.08 md** and skin damage of **+48.95**

utilizing and h_{net} value of **85 feet**. The flow efficiency of 15.57% suggests that the near wellbore conditions have a large affect on the injection volume limitations and that the total pressure drop is primarily due to conditions within a small radius from the well.

The following table provides comparative results with previous years tests and calculations. The primary variables affecting the calculated results are included.

Table 4.1
SUMMARY OF RESULTS

Date	Rate (gpm)	h_{net} (ft)	μ_w cp	slope psi/cycle	kh/μ	kh md-ft	k md	Skin
03/95	279	85	0.7100	8.486	183299	130142	1531	+49
03/94	168	85	0.7100	5.517	169620	120430	1417	+70
09/92	79.5	85	0.7000	2.710	163584	116145	1366	+117

The calculated results indicate a difference in transmissibility, (kh/μ) of 7.5% coupled with a 30% difference inskin values between 1994 and 1995. In addition, the results calculated from type curve analysis compare favorably to those calculated from the semi-log straight line analysis, thus supporting the integrity of the calculated results. The decrease in skin is possibly due to the continuous injection into WDW-49 (Well No. 4) following an extended shut-in period and a workover performed 5 days prior to the 1994 fall-off test.

Note: The start time of the infinite acting flow period exceeded the time to exit the waste front, therefore the viscosity of the original reservoir fluid was used for the final analysis.

A homogeneous simulator was utilized to confirm the calculated results mentioned above. The main assumptions were as follows: a single well with infinite acting and radial flow conditions being injected at a constant rate with constant reservoir conditions, such as porosity, permeability and compressibility. Based on this particular reservoir, the simulated data matched the actual data with a reasonable degree of accuracy.

The program used for final analysis and will simulation was 'KHS 5.0", marketed by Computer Aided Technical Services

See Table 4.2 and 4.3 for well information and calculated results, detailing input parameters and calculations.

Table 4.2
WELL INFORMAION

Well Type: Injection
Perforations: 3371.5' - 3579' (Gravel Pack Screen)

Gauge Depth: 3300 feet

[Input Parameters]

Reservoir Pressure	psia	P	1508
Reservoir Temperature	Deg. F	T	96
Final Static Pressure	psia	P_{si}	1508
Final Injection Pressure	psia	P_{inj}	1936
Water Flow Rate	gal/min	q_w	279
Sand Thickness	feet	h_{net}	85
Wellbore Radius	feet	r_w	0.4580
Formation Porosity	%	ϕ	33.0
Extrapolated Pressure	psia	P*	1498
Extrapolated Pressure @ 1 hr	psia	P_{1hr}	1519
Semi=Log Slope	psi/cycle	M	8.486
Production Time	hrs	t_p	801.00
Shut-in Time	hrs	t_{si}	23.92

[Fluid Properties]

Fluid Viscosity	cp	μ_w	7.1000E-01
Formation Volume Factor	RB/STB	β_w	1.0000E+00
Fluid Compressibility	1/psi	C_w	3.0547E-06
Total Compressibility	1/psi	Ct	5.0000E-06

[Type Curve Match Points]

ΔP	419.621			Pd	64.778
Δt	10.564	$C_d e^{2S}$	1E+50	t_D/C_d	8030.864

Table 4.3
Calculated Results

[Semi-Log Analysis - Multi-Rate Method]

Transmissibility	md-ft/cp	kh/u	183298.516
Flow Capacity	md-ft	kh	130141.938
Permeability	md	k	1531.082
Skin Damage	total	S	+48.95
Pressure Drop Due to Skin	psi	dP	+360.67
Flow Efficiency	%	FE	+15.57
Drainage Radius	feet	r_d	5136

[Type Curve (Log-Log) Analysis]

Transmissibility	md-ft/cp	kh/u	208507.813
Flow Capacity	md-ft	kh	148040.547
Permeability	md	k	1741.653
Skin Damage	total	S	+53.66
Pressure Drop Due to Skin	psi	dP	+347.61
Flow Efficiency	%	FE	+18.64

ECO Solutions, Inc.

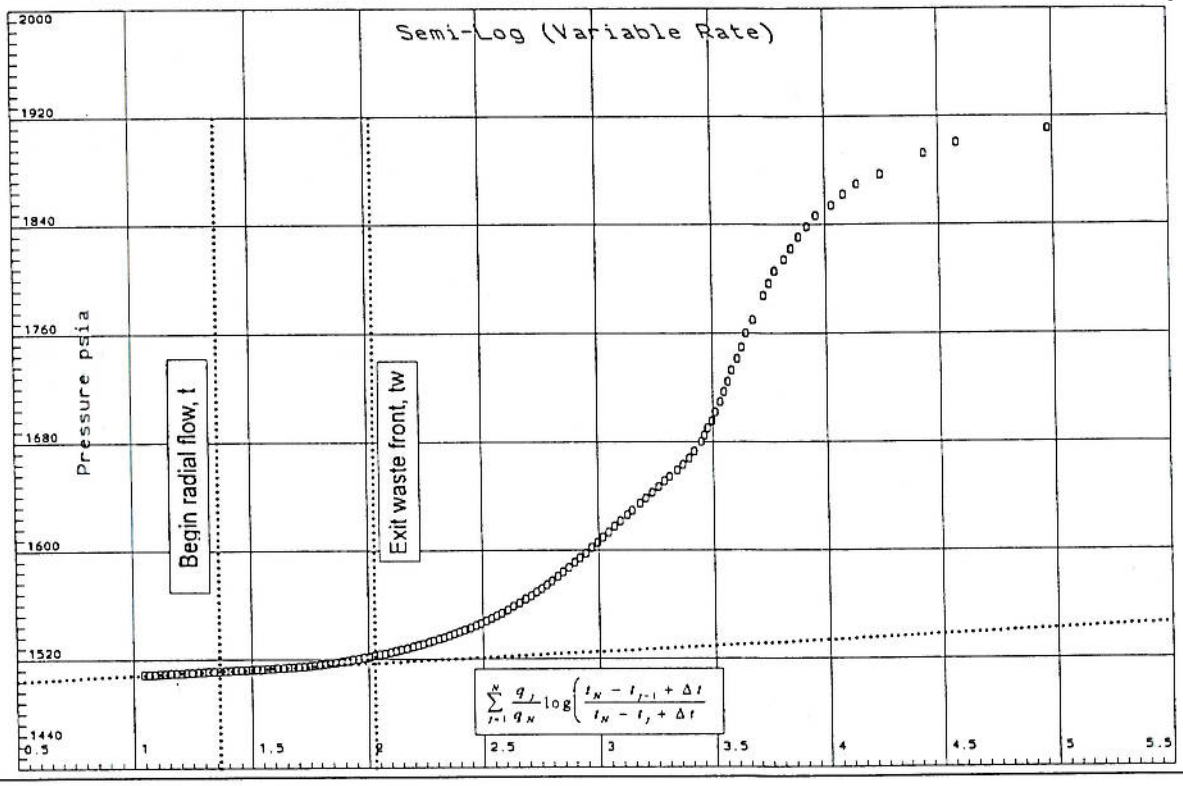
MECHANICAL INTEGRITY TEST

Fall-Off Test Data

Report File: 2008.KHS

Analysis Date: 03/27/1995

Semi-Log Radial Flow Plot



HOECHST CELANESE CHEMICAL COMPANY
WDW - 49 Well #4
Bay City Facility, Texas

03/06/1995 - through - 03/09/1995

Time to begin radial flow, $t = 9.6$ hours ($t_\Sigma = 1.36$)
Time to exit waste front, $t_w = 1.8$ hours ($t_\Sigma = 2.03$)

Graphical Results

Semi-Log Slope	psi/cycle	M	8.486
Extrapolated Pressure @ 1hr	psia	P_{1hr}	1519

Model Results

Transmissibility	md-ft/cp	kh/u	183298.516
Flow Capacity	md-ft	kh	130141.938
Permeability	md	k	1531.082
Skin Damage	total	S	+48.95
Pressure Drop due to Skin	psi	ΔP	360.67
Flow Efficiency	%	FE	15.57
Drainage Radius	feet	r_d	5136

FIGURE 2

ECO Solutions, Inc.

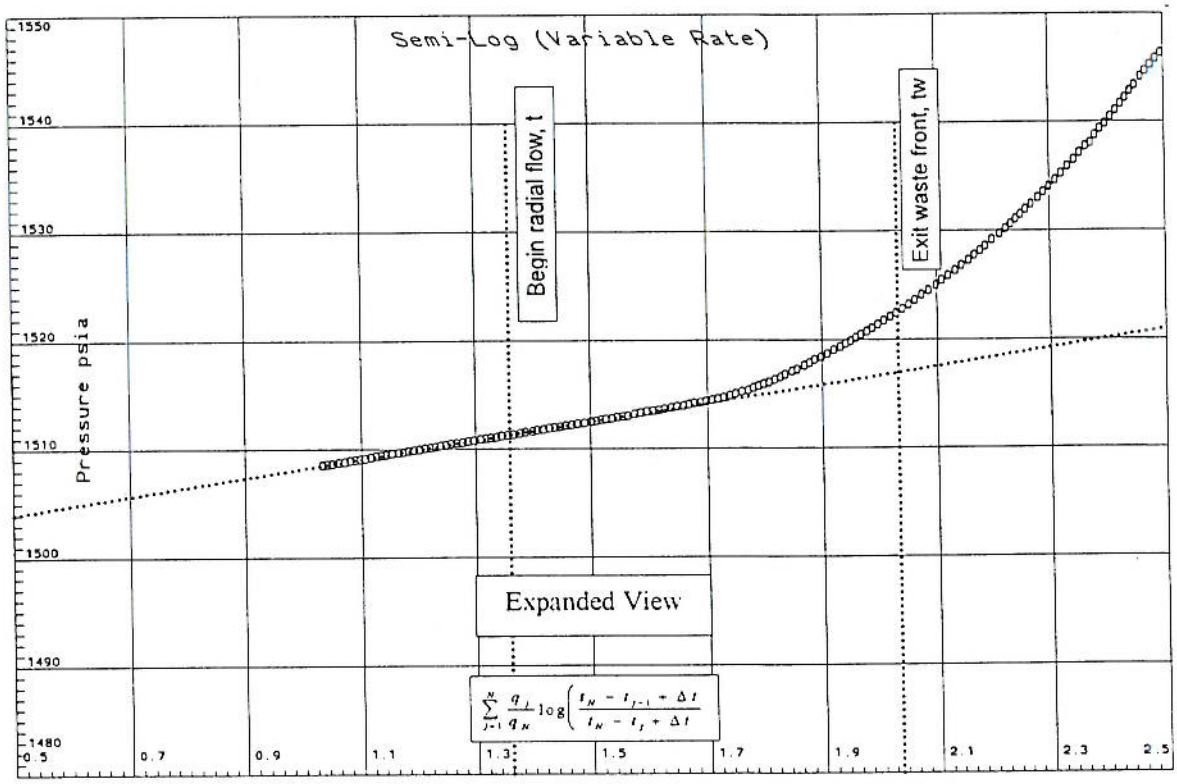
MECHANICAL INTEGRITY TEST

Fall-Off Test Data

Report File: 2008.KHS

Analysis Date: 03/27/1995

Semi-Log Radial Flow Plot



HOECHST CELANESE CHEMICAL COMPANY
WDW - 49 Well #4
Bay City Facility, Texas

03/06/1995 - through - 03/09/1995

Time to begin radial flow, $t = 9.6$ hours ($t_\Sigma = 1.36$)
Time to exit waste front, $t_w = 1.8$ hours ($t_\Sigma = 2.03$)

Graphical Results			
Semi-Log Slope	psi/cycle	M	8.486
Extrapolated Pressure @ 1hr	psia	P_{1hr}	1519
Model Results			
Transmissibility	md-ft/cp	kh/u	183298.516
Flow Capacity	md-ft	kh	130141.938
Permeability	md	k	1531.082
Skin Damage	total	S	+48.95
Pressure Drop due to Skin	psi	ΔP	360.67
Flow Efficiency	%	FE	15.57
Drainage Radius	feet	r_d	5136

FIGURE 3

ECO Solutions, Inc.

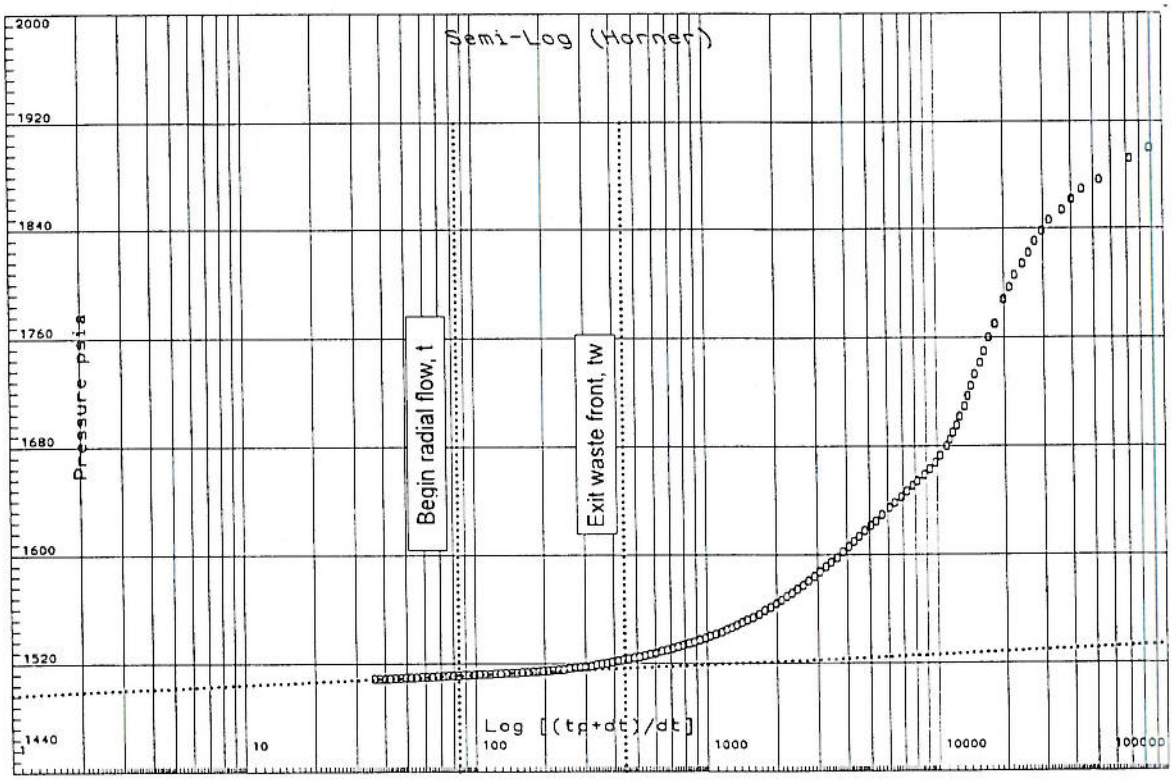
MECHANICAL INTEGRITY TEST

Fall-Off Test Data

Report File: 2008.KHS

Analysis Date: 03/27/1995

Semi-Log Radial Flow Plot



HOECHST CELANESE CHEMICAL COMPANY
WDW - 49 Well #4
Bay City Facility, Texas

03/06/1995 - through - 03/09/1995

Time to begin radial flow, $t = 9.6$ hours ($t_{Horner} = 84$)
Time to exit waste front, $t_w = 1.8$ hours ($t_{Horner} = 441$)

Semi-log plot utilizing Horner time function used to extrapolate P* and illustrate the beginning of radial flow and time to exit waste front.

Graphical Results

Semi-Log Slope	psi/cycle	M	7.313
Extrapolated Pressure @ 1hr	psia	P_{1hr}	1518
Extrapolated Pressure	psia	P*	1497

FIGURE 4

ECO Solutions, Inc.

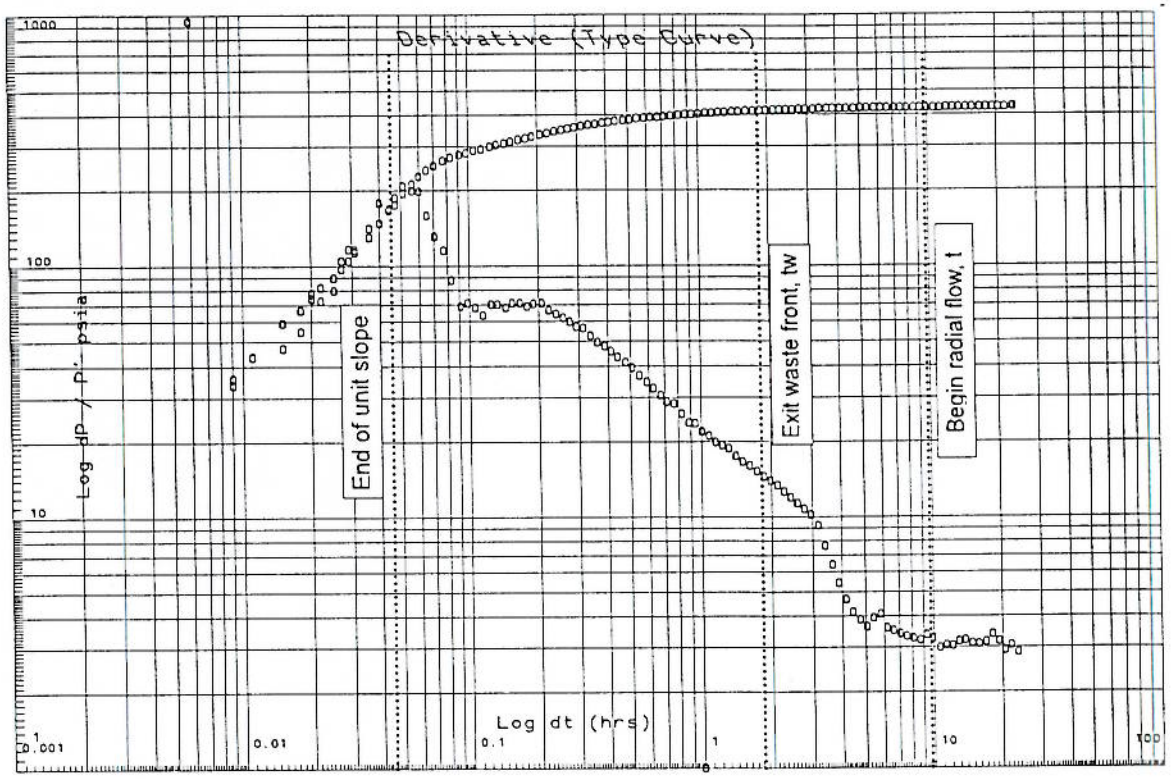
MECHANICAL INTEGRITY TEST

Fall-Off Test Data

Report File: 2008.KHS

Analysis Date: 03/27/1995

Log-Log Radial Flow Plot



HOECHST CELANESE CHEMICAL COMPANY
WDW - 49 Well #4
Bay City Facility, Texas

03/06/1995 - through - 03/09/1995

Log - Log plot used to identify various flow regimes.

Time end of unit slope, $t = 0.045$ hours
Time to begin radial flow, $t = 9.64$ hours
Time to exit waste front, $t_w = 1.82$ hours

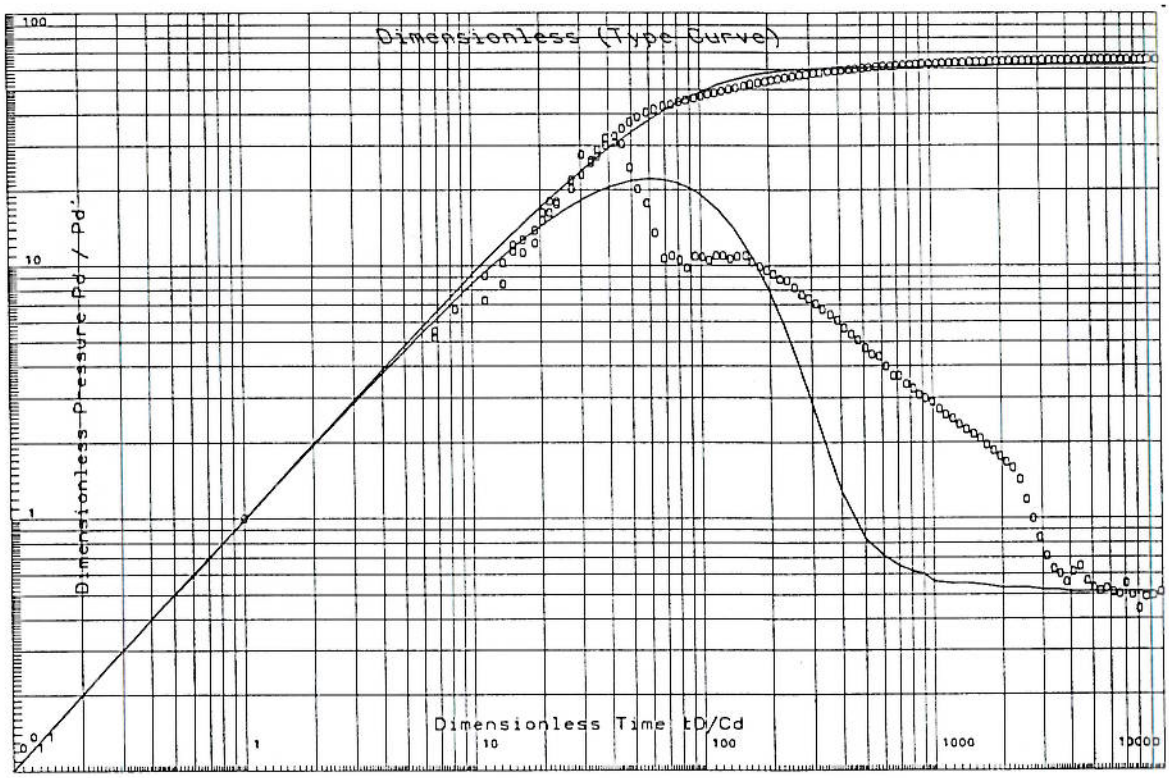
FIGURE 5

ECO Solutions, Inc. | Report File: 2008.KHS

MECHANICAL INTEGRITY TEST | Analysis Date: 03/27/1995

Fall-Off Test Data

Log-Log Radial Flow Model



HOECHST CELANESE CHEMICAL COMPANY
WDW - 49 Well #4
Bay City Facility, Texas

03/06/1995 - through - 03/09/1995

Log - Log analysis utilizing Agarwal Equivalent time function.

Match Results

ΔP	419.621		P_d	64.778
Δt	10.564	$C_d e^{2S}$ 1E +50	t_D/C_d	8030.864

Model Results

Transmissibility	md-ft/cp	kh/u	208507.813
Flow Capacity	md-ft	kh	148040.547
Permeability	md	k	1741.653
Skin Damage	total	S	+53.66
Pressure Drop due to Skin	psi	ΔP	347.61
Flow Efficiency	%	FE	18.63

FIGURE 6

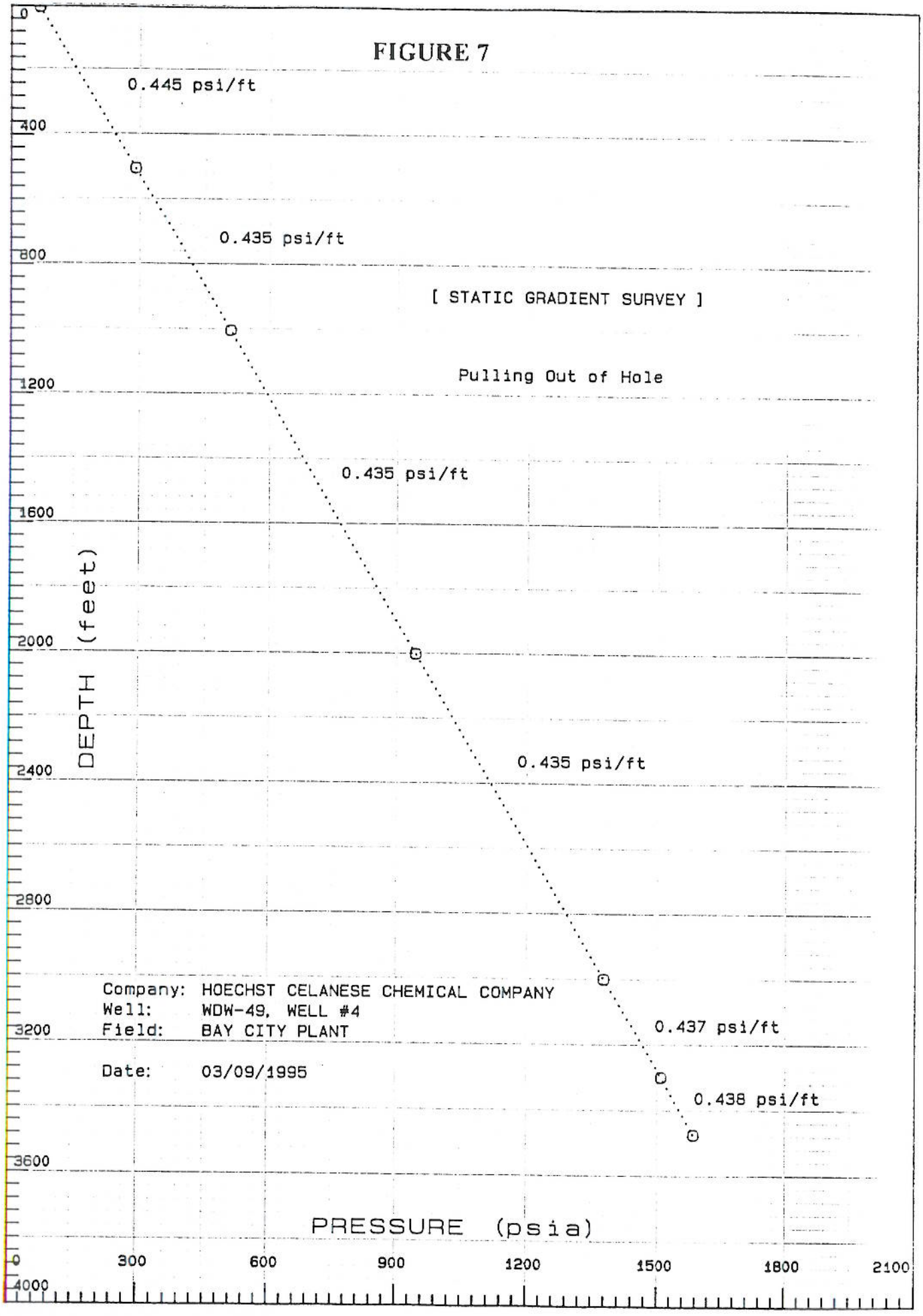
4.2 STATIC GRADIENT SURVEY

A Static Gradient Survey was run while pulling out of the hole immediately after the end of the bottom hole pressure fall-off test. Stops were made at 3475', 3300', 3000', 2000', 1000' and 500'. A plot of the static gradient survey is shown in Figure 7. Data collected during the survey is included in Appendix G.

Data collected at each gradient stop were as follows:

Depth (ft)	Pressure	PSI/ft
0	66.46	
500	289.04	0.445
1000	506.57	0.435
2000	942.02	0.435
3000	1377.23	0.435
3300	1508.44	0.437
3475	1585.02	0.438

FIGURE 7


0.445 psi/ft
0.435 psi/ft
[STATIC GRADIENT SURVEY]
Pulling Out of Hole
0.435 psi/ft
0.435 psi/ft
0.437 psi/ft
0.438 psi/ft
DEPTH (feet)
0
400
800
1200
1600
2000
2400
2800
3200
3600
4000
Company: HOECHST CELANESE CHEMICAL COMPANY
Well: WDW-49, WELL #4
Field: BAY CITY PLANT
Date: 03/09/1995
PRESSURE (psia)
0
300
600
900
1200
1500
1800
2100